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External Shocks and International Inflation Linkages:
a Global Vector Autoregressive analysis

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To Lisa,

Abstract

In my dissertation I examine the short-run inflationary effects of 'historical' exogenous shocks, in particular oil and food prices hikes, for a given set of economies under study. Then, I assess the importance of inflation linkages among countries, by disentangling the geographical sources of inflationary pressures for each region. I estimate a Global Vector Autoregressive (GVAR) model containing 22 country-specific VARX* models representing both industrialized and developing economies. Core inflation, headline inflation, nominal short-term interest rate and nominal effective exchange rate are the variables specific of each country, while oil and food prices are the global variables. The analysis is carried on monthly data for the period spanned from January 1999 to December 2007. The dynamical analysis is undertaken using the generalized impulse response approach, that is particularly suited for a multicountry framework such as the GVAR. Generalized impulse response functions reveal that oil price shock inflationary direct effects mostly affect developed regions while lower effects are observed for emerging regions. Food price rises have significative inflationary direct effects, especially for emerging economies. Due to both oil and food prices shocks, no significant second-round effects are observed for US and Euro Area, while the opposite is found for the Baltic countries and the Other Developed European countries. Generalized forecast error variance decompositions indicate that there exist considerable geographical and trade-based linkages among regions through which inflationary pressures are transmitted. In addiction, a considerable part of the observed headline inflation rises is attributable to foreign sources for the vast majority of the regions.

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Introduction

The increasing commercial and financial integration of world countries is at the present juncture rising a number of important issues concerning the potential implied threats. In particular, the majority of the world economies are observing a considerable degree of vulnerability to sudden external shocks. External shocks originate from various typologies of sources that are often beyond the economic sphere. For example, a localized geographical natural catastrophic event could destroy the agricultural output giving rise to a large increase in food prices due to the consequent shortage. Moreover, political events, such as crises and conflicts, could compromise the relationships among countries, and consequently weaken the previously existent trade linkages. Nonetheless, even though the sources of these shocks are heterogeneous, their effects are timely reflected on macroeconomic performance of affected countries. These macroeconomic effects could be generalized to the whole world economy, for example when a supply shock in a local market involves large variations on international commodity prices, or they could spread 'by contagion' across countries through transmission channels not easily recognizable. Managing to identify the correct transmission channel through which external shocks propagate is actually a difficult task, since shocks pass-through across the modern economies affect both the real and the financial sides of the economy. In addiction, other transmission channels, not economical, such as psychological and geographical, are currently at work in spreading exogenous shocks effects.

Monetary authorities are actually paying particular attention to the inflationary effects due to external shocks. They are considerably interested in disentangling

the observed rate of inflation increases between the domestic- and foreign- originated components. In fact, while the domestic-originated inflation could be directly controlled by a central bank through the setting of the official interest rate, when the domestic rate of inflation originates in large part from foreign inflation spill-overs, monetary policy makers could not manage to counteract completely the inflationary pressures, since they do not control directly the source of the inflationary shock. As a consequence, foreign inflationary pressures still have second-round effects on the headline inflation for number of world countries. Thus, for monetary policy purposes it is fundamental to monitor the foreign inflationary environment, specifically the inflation performances of foreign countries with which the given country is linked. In order to deal with non-domestic shocks and their consequently inflationary pressures, the strategy of inflation targeting is gaining a general agreement among the majority of central banks around the world. In practice, central banks commit themselves to maintain a low rate of inflation by publicly declaring a target range in which the planned rate of inflation would float. The main rationale consists in assuring households and businesses a low and stable rate of inflation by contrasting firmly the effects of external shocks. If this strategy is successful, domestic inflation expectations of workers and firms would be anchored to low levels. Workers would not start a dangerous wages-prices nexus while firms would not pass-through the imported inflationary pressures to consumer prices, both the parts aware that the inflationary effects would not be persistent. For this type of monetary policy regime two issues are central. First, the role of credibility takes a fundamental place, since inflation expectations will be anchored to low levels only if households and business trust in the monetary authorities commitment. Second, a persistent external shock would not be easily perceived as having temporary effects, even though the monetary authorities are exhibiting a great effort in counteracting the adverse effects.

In my application I estimate a Global Vector Autoregressive (Global VAR) model, as developed by Pesaran, Schuermann and Weiner (2004) and further by

Dées, di Mauro, Pesaran, Smith (2007), which includes 33 countries using monthly data for the period spanned from January 1999 to December 2007. Each country is modeled as a Vector Autoregressive model augmented by weakly exogenous variables (VARX*), in which the endogenous variables are: core rate of inflation, headline rate of inflation, nominal short-term interest rate and nominal effective exchange rate. The inclusion of weak exogenous variables, specifically both foreign-specific and global variables, allows to represent the external influence specific of each considered economy. Then I perform two exercises.

First, I examine the effects of two exogenous shocks, namely an adverse shock to both food and oil prices, on a set of macroeconomic variables of both developed and emerging economies by employing the generalized impulse response functions (GIRFs), as developed by Koop, Pesaran and Potter (1996). This technique, alternative to the traditional approach of Orthogonalized Impulse Responses (OIR) developed by Sims (1980), is particularly suitable for multi-country models such as the GVAR model since it yields country-ordering and variables-ordering invariant outcomes. The main issues of this exercise are:

- Do these two shocks have different inflationary impacts?
- Is there a significant pass-through of external shocks to the core inflation?
- To what extent do the inflationary effects are persistent?

I focus my attention on the inflationary effects of external shocks, by evaluating the responses of both the overall rate of inflation and the core rate of inflation, the latter calculated by basing on the Consumer Price Index excluding food and energy prices. Inflationary effects of these exogenous shocks could be disentangled in two components. First, a first-round effect passing on overall (e.g. headline) rate of inflation, since oil and food prices are included in the consumer price index. Moreover, the first component includes indirect effects due to changes in non-oil based products prices. Second, a second-round effect passing from the overall rate of inflation through the core rate of inflation. By the specifical core inflation measure

chosen, it is assured that exogenous shocks effects would not pass directly into core inflation. Evaluating the degree of this second-round effect could have important implications to the extent to which it could help understanding how core inflation, that is generally considered the domestic-generated component of rate of inflation, respond in each of the considered countries. In addiction, evaluating inflation performances of countries following different monetary policy regimes and exhibiting different degrees of trade openness could improve our knowledge on the conduct of the monetary policy. GIRFs outcomes reveal that oil price shock first-round inflationary effects mostly affect developed regions while lower effects are observed for emerging regions. These result may suggest that developed economies are still highly dependent on crude oil price changes, therefore a substantial substitution towards cheaper energy sources is not yet complete. In addiction, food price rises have mostly significative inflationary effects, especially for emerging economies. For the vast majority of developed regions, there are not significant second-round effects of external shocks passing through the core inflation, while the opposite holds for number of emerging economies. This result is consistent with Hooker (2002), which he suggests that the particular reaction function of the monetary authorities mainly determines the degree of observed second-round effects on the economy.

As a second exercise, I evaluate the international linkages existing among countries and regions by simulating rises in overall rates of inflation in each region and then, by means of the generalized forecast error variance decompositions (GFEVDs), I decompose the forecast error variances of each simulated shock, in order to allocate the forecast error variance for a region into its respective source regions. The issues to be addressed in the following exercise are:

- Which are the main transmission channels of international transmission of inflationary shocks?
- Which foreign regions are mostly involved in the inflationary innovation in a given region?

- How much of the inflationary innovations in a given region are accounted for by both domestic- and foreign-originated innovations?

The GFEVDs outcomes reveal some interesting results. First, the headline rate of inflation mainly explains the shock, both at domestic and foreign levels. While the importance of headline inflation decreases over time, the opposite is observed for the effective exchange rate. This finding suggests a different perception on the persistence of exchange rate changes: in particular, by considering an exchange rate innovation more reversible than persistent, firms do not timely change their prices, rather they adjust their mark-ups. This 'pricing-to-market' strategy implies an observed incomplete exchange rate pass-through, at least in the short-run. Second, there exist considerable geographical linkages among regions through which inflationary pressures are transmitted. As expected, these linkages are region-specific and asymmetrical. Third, a considerable part of headline inflation changes in the vast majority of the considered regions is attributed to foreign sources. This implies a limitation for national monetary authorities in controlling domestic inflation, suggesting the need for a more intensive coordination among countries in countering inflationary pressures. Moreover, the importance of foreign sources increases over time, suggesting that the exchange rate pass-through, being incomplete in the short-run, tends to be complete over time following the purchasing power parity relationship.

The organization of the dissertation is as follows. In Chapter 1 I briefly present the Global Vector Autoregressive (GVAR) modeling approach. In Chapter 2 I build a GVAR model in order to analyze both the effects of external shocks and the international inflation spill-overs. All the steps of my study, specifically the data analysis, the GVAR model estimation, construction and dynamical analysis were implemented in MATLAB. Finally, I conclude in Chapter 3.

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